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THE JOURNAL OF AVIATION/AEROSPACE EDUCATION & RESEARCH

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EDITORIAL FOCUS

The Journal of Aviation/Aerospace Education & Research (JAAER) is a scholarly publication for educators and researchers as well as for professionals in the aviation and aerospace industry. The focus is how the educational process is influenced by various segments of the aviation and aerospace community and how education affects the industry. Although the basic focus is toward colleges and universities, manuscripts concerning secondary and elementary education are encouraged.

The Journal is interested in a wide range of scholarly submissions concerning aviation/aerospace curriculum development and/or innovative methods of instruction (for any/all levels of education), significant research relating to aviation/aerospace education, to industry research, and to industry and education partnerships. The Journal welcomes submissions reflecting the latest industry and academic thought concerning current issues of interest to JAAER readers, and is interested in well-researched and documented stories concerning aviation history, both in the past and in the making.

A refereed publication, manuscripts are blind-reviewed by members of the editorial board as well as by a limited number of professionals in that field. From time to time a non-refereed article may be included in a FORUM section.

AUTHOR'S GUIDELINES

Preparation of Manuscripts The most current edition of the Publications Manual of the American Psychological Association (APA) is used as the style guide for submissions. However, authors are instructed to include all tables in the body of the manuscript.

JAAER does not accept multiple submissions. (If pending acceptance elsewhere do not submit to us.)
Submit five copies of the manuscript using standard, white, bond paper.
if printed by computer, print must be clear and easily readable. if a dot matrix printer is used, Near Letter Quality (NLQ) is acceptable if good quality ribbon and paper is used. if typewritten, use a good ribbon and non-smear, white paper.
Double space the text. Use wide margins (1.5"-2") on both sides and top and bottom.
Do not right (full) justify the manuscript
Do number the pages

Title The title of the manuscript should be clearly indicative of its subject and of the author's intention, and should not be unnecessarily long or convoluted.

Documentation Manuscripts are to conform to APA reference documentation. Text reference citations and reference list entries must be identical.

Autobiography On a separate sheet of paper, include a brief autobiography stating your qualifications for writing this article. if multiple authors, give a brief autobiography for each author.

Publication Policy With your initial manuscript submission JAAER requires a full statement that this manuscript has not been previously published elsewhere, is not submitted and pending acceptance elsewhere, and will not be submitted for publication elsewhere in its present form.

If you have questions about submitting an article or subscribing to the Journal, please call 904-226-6855. Office hours are from 9:00 a.m. to 2:00 p.m. on Tuesday, Wednesday, and Thursday.

EDITORIAL

A NEW PARTNERSHIP IS FORMED

This issue of The Journal of Aviation/Aerospace Education and Research (JAAER) is the result of a new relationship that has been formed between the Federal Aviation Association (FAA) and JAAER). Funded by a contact with FAA, the journal sought to bring together some of the Nation's leading aviation/aerospace practitioners for the discussion and debate. This mission became a reality at the National Congress on Aviation and Space Education in Orlando this past May when five invited presenters shared their ideas about aviation/aerospace education with other attendees.

The next segment of the project was the preparation and dissemination of this special issue of JAAER. This issue contains those papers that were presented in Orlando as well as two previous JAAER articles that are considered by the editorial staff as being of major importance. Specifically, those articles are by Alexander Wells and Frank Mitchell and address the issue of writing for publication and the award program by the General Aviation Manufacturers Association (GAMA) respectively.

The final part of the project is the issuing of a Call for Papers for the 1994 National Congress on Aviation and Space Education which takes place in Norfolk, VA in April. This call invites you to submit a short abstract of a possible paper to the journal by December 15, 1993. Your potential paper should focus on an issue that is important to you or the education community and possibly to the aviation/aerospace industry.

It is the hope of all concerned that a Call for Papers will quickly become an integral and important part of every future Congress. However, such an endeavor is possible only with your support in the form of topic submissions; your help is an absolute must if this exchange of ideas in the form of scholarly inquiry and thought is too continue. The partnership has been formed and the call has been issued; can we count on your support?

HRL

NCASE 1994 CALL FOR PAPERS

The Journal of Aviation/Aerospace Education and Research
invites papers on current issues, the application of advanced technologies,
aviation/aerospace education, and aviation/aerospace history.

Selected papers will be presented during a symposium at the 1994 National Congress on Aviation and Space Education, to be held in Norfolk, Virginia.

The purpose of this call for papers and symposium is to bring together for debate and dialogue, representatives from educational institutions, the aviation industry, and government Through communication a better understanding can be achieved of the complexities and needs of the field of education and of the aviation and aerospace industry.

Following are some suggested topics, although authors should not feel that this list is all-inclusive.

- Innovative methods of teaching
- Testing and evaluation of the educational process
- Benefits of quality education to the aviation industry
- Industry support of education
- Advanced technology impact on:
  - Education
  - Training

Authors are invited to submit abstracts of 250 words on any of the above topics, or a topic of choice on education or the aviation industry. A short biographical sketch of the author(s), mailing address, telephone number and FAX number should be included with the abstract.

Abstracts are due not later than December 15, 1993.

SEND ABSTRACT TO:

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AEROSPACE EDUCATION
vs
AVIATION AND SPACE EDUCATION

Hal Bacon

There are many different organizations involved in developing programs and teaching materials which use aviation and space concepts in education. These entities include governmental agencies, private industry, aviation and space associations and lobbying groups, and private non-profit organizations. Each of them has a different vested interest in aviation and space, and therefore each has a different idea about what aviation and space education really is. Also, each uses different terminology for their programs. Some are called aviation education, while others use terminology such as air age education, aeronautical education, aviation science, space science education, aeronautics and space education, air and space education, aerospace technology, and aerospace education. Is it any wonder that the ultimate users of these programs--the education community--are confused about what aviation and space education is really all about?

These aviation and space education programs have almost as many goals and objectives as there are organizations involved in them. Some are designed to use aviation and space concepts to help teach traditional school subjects. Others have a goal of preparing pilots, astronauts, air traffic controllers, airport managers, or professionals for other aerospace related fields. Still others look at using a youngster's interest in aviation and space as a way to improve the math and science skills of the student M of these are worth- while goals, and there is a place for each of these programs in education today.

WHAT IS AEROSPACE EDUCATION?

My organization, Civil Air Patrol, also has its own terminology and its own definitions. We call our program Aerospace Education, a term which was coined by Civil Air Patrol in 1958. Our vested interest and the goal of Aerospace Education is to ensure that the American citizenry has an understanding of and an appreciation for the important part aerospace plays in every aspect of our nation's remaining a world power. this mission requires an understanding of the social, political, and economic impact of aerospace activities upon society. This makes our program a little different from all of the other organizations'. the only vested interest we have is to ensure that the U.S. maintains its place as the number one nation in the world in the field of aerospace.

The Civil Air Patrol aerospace education program began under our good friend Dr. Mervin K. Strickler in the early 1950s--although back then it was called aviation education. He gave us our philosophy and our definition, My organization, Civil Air Patrol, also has its own and the only change that has been made in the inter-education. He gave us our philosophy and our definition, and the only change that has been made in the intervening 40 years was to change the name from aviation education to aerospace education when the space age began. Let me spend a few minutes telling you why we believe aerospace education, as we define it, is so important.

AEROSPACE--A DEFINITION

The word aerospace is relatively new. It was coined by the United States Air Force in 1958 by the Air University at Maxwell AFB Alabama. The world "aerospace" was formed by combining the term "aero"--referring to air or atmosphere, and "space"--referring to that vast arena beyond the atmosphere. What this tells us then is that aerospace is, first of all, an environment--an environment that begins at the surface of the Earth and extends upward as far as you want to go. As our science and technology improve an our ability to look out into this

environment improves, we see that it seemingly continues forever. Not many years ago we were teaching that the universe was approximately 8 billion light years in diameter. But through improvements in radio astronomy and from scientific spacecraft flying ins pace, we now see that it is more than twice that size.

Secondly, aerospace is an area of activity. mankind has begun to explore and to utilize this environment. We explore the aero part of this environment with aircraft and explore the space part with spacecraft. the act of exploring this environment, whether it is within the atmosphere or in the space beyond, it called "flying." We fly aircraft within the atmosphere and fly spacecraft into space beyond the atmosphere. Flight has always had a certain fascination for mankind. Millions of years ago, cavemen used to watch birds in flight and wish they could also fly. To them flight represented freedom--a freedom they did not possess. They were land bound, they had to walk wherever they wished to travel, but they watched the birds, and they dreamed about the freedom of being able to fly across the rivers and the mountains and the other barriers that barred their travel. to these ancient civilizations, there was something almost supernatural about flight, and so they endowed their gods with this supernatural ability they did not themselves possess. And so down through the ages mankind has dreamt about flight and even today we seem to all possess a kind of innate fascination about flying. But the interesting thing is that mankind's ability to explore and utilize the aerospace environment--mankind's ability to fly--is a very recent occurrence.

It first became a reality at 10:35 a.m. on December 17, 1903 at Kill Devil Hill, North Carolina, when two bicycle mechanics, Orville and Wilbur Wright, took a wooden and wire and fabric box kite, placed a gasoline engine on it, and for the first time in history made a controlled, sustained, and powered flight in a heavier-than-air craft.

--and the world would never
be the same.

Mankind had flown-mankind now possessed the freedom of the birds, and everything we know about aviation and space flight has all happened since that day less than 90 years ago. Let's spend a few minutes looking at the different parts of the aerospace community that all play a vital part in aerospace education.

THE AEROSPACE COMMUNITY

All activity within the aerospace environment--all flying--can be placed into one of four categories. All flight within the aero portion of the aerospace environment falls into either military aviation or civil aviation. Military aviation, of course, is any flying done by either the Army, the Navy, the Air Force, or the Marine Corps, and civil aviation encompasses all other aviation. Civil aviation is further broken down into general aviation, air carrier aviation, and government aviation.

On the space side of the aerospace environment we have basically the same situation. We have a military space program and a civilian space program. The civilian space program is administered by the National Aeronautics and Space Administration (NASA) and is organized for "the peaceful exploration of space --for the benefit of all mankind." Our military space program is administered by the United States Air Force through the U.S. Space Command and is organized to ensure our national security in the space arena.

The next portion of the aerospace community I want to discuss is the aerospace industry, which is composed of the approximately 64 major companies that build the hardware used by the military and civilian aerospace users. This is the industry to which people refer when they use the term "high-tech" and is a valuable national resource. I will discuss this in more detail later.

The final part of the aero space community and the most important part is the foundation upon which all of the other parts rest--aerospace education. In a democracy, the citizens ultimately decide the priorities of national programs, and history shows us that the American public will generally support those programs it understands. If this is true, the maintenance of our nation's leadership in aviation and space is dependent on the American public understanding and supporting our aerospace programs.
Whether the Untied States remains the world leader in building commercial jet airliners--whether we build the C-17 transport to replace the aging C-141 Starlifter, and the F-22 fighter to replace the F-15--depends on whether the citizenry understand why such airplanes are needed.

More and more the voters are faced with making, decisions about what programs are most important. Do we need a new airport or should we use that money to build a new school? Should we spend more money on research in aerospace or should the money be spent on research on a cure for AIDS? These all legitimate questions, and the choices are all difficult. The important thing is that the voters make informed decisions--and that's not possible unless people know something about aerospace and its importance to our society. I want to spend the rest of my time talking about some of the aerospace issues facing our nation today because the issues in aerospace issues facing our nation today because the issues in aerospace education are the same as the issues in aerospace.

ISSUES IN AEROSPACE

At the end of 1989, there were more than 13 million people in the United States who were either directly or indirectly employed in the field of aerospace. Of these, more than 8 1/2 million were employed in the civil aviation area, and the other 4 1/2 million were employed in either military aviation or in the space program. This segment of our nation's work force brought $.75 trillion into our economy, and their payroll exceeded $266 billion. In anybody's eyes these are big numbers which make a tremendous impact on our nation's economy. However, as you know, in the last three years there have been some large scale reductions in this area. One of the reasons is because we won the cold war. Ever since 1945 we have been engaged in the so-called cold war with the Soviet Union. this has been the major impetus behind our defense build-up and our space program, and civil aviation advances all spun-off our effort to keep ahead of the Russians.

With collapses of the Soviet Union our national leadership begin talking about a "peace dividend" which would be available because we no longer needed to continue our defense spending at such a high level. Combined with this reduction in orders from the Department Of Defense, the industry also got hit with a cut back in orders for commercial jets from the airlines. Between 1970 and 1990, the passengers carried by the world's commercial airlines doubled. Its increase in passenger travel caused the world's airlines to place large orders for new aircraft from the manufacturers. In 1990, a worldwide recession coupled with increases in fuel costs and a reduction in flying because of the Gulf War suddenly changed all that. The airlines began to lose large sums of money. For example, the U.S. airlines lost almost $8 billion. That was more than all the profits made by all the airlines since they begin operation in 1927. To counteract these losses, the airlines began streamlining their operations and laying off employees, eliminating flights, and canceling or deferring delivery of many of the new aircraft they had on order.

The aerospace industry had no choice but to also begin laying off employees. In 1989, employment in the aerospace industry peaked at 1,314,000 workers. At the end of 1992 that had been reduced to 1,128,000--a loss of 186,000 jobs in three years. This jobs reduction will continue through 1993 and probably 1994 and should bottom out at about 1,050,000. This jobs reduction will continue through 1993 and probably 1994 and should bottom out at about 1,050,000. this represents a loss of about $2.6 billion to the communities where these industries are located. On January 1, 1993, Boeing Aircraft had 1,250 aircraft worth $82.6 billion on order. More than 59% of those orders were from foreign airlines. On January 29, because of continued deferment in deliveries, Boeing announced another round of production cuts, their fifth production cut since 1991. They estimated that these actions will result in additional layoffs of 30,000 employees. Of course, the cutbacks will also impact all of the other industries that provide parts for the aircraft. These same cutbacks are having an effect on the foreign aerospace manufacturers such as Airbus Industry but not to the extent that they impact U.S. manufacturers. Most foreign manufacturers are state-owned which means that they do not have to make a profit or make their stock-holders happy. The state also underwrites most of their research and development, which also puts our manufacturers at a disadvantage when competing against them. In the past, this has not been serious because U.S. technology was so far ahead of the foreign manufactures that most aircraft sold worldwide were made in the United States. During the past decade, the foreign manufacturers have really begun cutting into the technology lead of the U.S. Today, many of the foreign manufacturers are producing aircraft that are very competitive with the aircraft built by Boeing or McDonnell Douglas--and in many cases an airline can get

better financing and other incentives to forecasts indicate that the airlines will return to profitability during 1993, and long-range forecasts are that airline travel will increase at a rate of 4-6 percent a year after that time. If this is true, airline travel will double by the year 2010. The International Civil Aviation Organization's (IC)A) long-range forecast projects a market for 11,000 new transports worth $800 billion by 2010. there are currently about 14,000 commercial aircraft in service in he world's airlines. With this kind of market and given the reputation the U.S. has always had in manufacturing airliners, we must do all we can to ensure that our manufacturing airliners, we must do all we can to ensure that our manufacturers remain viable and competitive in the near future. Many people say that we don't have to worry about the U.S losing its position as the world's leader in manufacturing commercial airliners. this is exactly what people were saying ten y ears ago about our general aviation manufacturers. At t time, Cessna, Piper, and Beech the world's leaders in the manufacture of single-engine general aviation aircraft. Today, that area of their business has completely disappeared. Although they were manufacturing 15,000 plus aircraft a year then, now they are building fewer than 2,000 per year. France, Japan, Brazil, and other foreign manufacturers have completely taken that market away from us.

SUMMARY

This, then, is what aerospace education is about and how it differs from other aviation and space education programs. The issues that aerospace faces are the same issues that we in aerospace education face. As the very dynamic aerospace world changes, we must remain informed about the changes and have the flexibility to respond to them. It is absolutely vital that the American citizenry remain informed about and supportive of our nation's aerospace activities, whether they be in civil aviation, in military aviation, or in the space arena. Our very survival--in more ways than one-depends on its. this is our challenge as we enter the 21st century.

Harold L Bacon earned a Master's degree in Science Education from Pennsylvania State University and a Bachelor of Science degree from Montana State University. involved in aerospace education since 1963, Bacon is currently serving as Chief, Aerospace Education Division at National Headquarters of the Civil Air Patrol, United States Air Force.

Abraham Lincoln Said, "Ambition and education are the wings of great actions."
Edmund Burke related, "it is well known that ambition can creep as well as soar."

As Chairman of the National Coalition for Aviation Education, I appreciate this opportunity to address your Issues in Aviation and Space Education cross-talk session of the 1993 National Congress on Aviation and Space Education. I want, on behalf of my NCAE colleagues, to relate to you why aviation can provide the wings that accomplish their dreams, and why your dedication to aviation education is one of the primary ways that individuals can look above what they presently understand and say "I can soar."

With this in mind, I have entitled my presentation:

AVIATION EDUCATION - WHY?

Tyson W. Whiteside

I will outline four areas which I believe encompass the reasons the industry has formed the National Coalition for Aviation Education (NCAE). I'll talk about the confluence of factors which influenced the aviation industry to establish the NCAE and what the organizing associations see as its mission. Ill speak on some of the special needs that NCAE can assist educators in regarding the training and education of young people as well as the existing aviation workforce. I'll look into the need for all of us involved in aviation education to work together to build effective political constituencies at the local, state, and national levels. We need to influence both the public and our governmental decision-makers So that we can revitalize an industry that once dominated world technology and manufacturing, and the hearts, dreams and ambitions of many young people who looked to the stars as their way to future success.

THE NATIONAL COALITION FOR AVIATION EDUCATION -- WHO ARE WE?

By the text of the NCAE Mission Statement, the National Coalition for Aviation Education "represents industry and labor, united to promote aviation education activities and resources; increase public understanding of the importance of aviation; and support education initiatives at the local, state and national levels" (p.2).

There are fourteen founding members of the NCAE. They are the following:

Aircraft Electronics Association
American Helicopter Society
Aviation Distributors and manufacturers Association
Experimental Aircraft Association
Helicopter Association International
International Association of Machinists and Aerospace Workers
National Aeronautic Association
National Air transportation Association
National Association of State Aviation Officials
Aircraft Owners and Pilots Association

National Business Aircraft Association
Opportunity Skyway
Professional Aviation Maintenance Association

As you can see, the NCAE includes almost every organization which has an active and diverse aviation education program managed as a part of their association's services to their members and their communities.

The National Coalition for Aviation Education had its genesis from four important factors.

First was the innovative initiation of the Federal Aviation Administration (FAA) Partnership Program with industry organizations to utilize the resources of both the FAA and the individual organizations to advance each organization's aviation education programs and encourage public awareness of aviation. This partnership began to sow the seeds of a cooperative spirit within the industry and FAA as it regards the importance of aviation education.

Second, last fall Phil Woodruff, Director of the Office of Aviation Education for FAA, called a meeting of aviation trade associations to discuss aviation education and the programs which the industry supported. I have never seen as many heads of these organizations in the same room at the same time on any issue. This meeting attendance pointed out the high priority which these organizations established for their aviation education programs. But as each organization presented its programs, it also graphically pointed out that many of us were in the same business. We had just put different names on our aviation education efforts. We had common goals. We had common efforts. We had resources. But we weren't talking to each other regarding how we could help one another achieve our common goals and how we could maximize the use of our resources. The "light came on" and we could see a potential need for an industry forum to talk about aviation education and to communicate to each other what we were doing in the education arena. This forum was not to be a group which would control educational programs but a communications forum for industry, government, and educators--a forum where educators could find out what was going on with industry in aviation education and where industry could share ideas.

The third element was the fact that the aviation industry has always recognized that the educational system is a major component in developing the talent we need in the aviation community, both at the skilled trade levels and in managerial positions. We are not necessarily faced with individuals entering the industry who do not always have the skill training that the industry needs for them to be immediately productive in the aviation business. Part of the reason is that the industry has not been effective in communicating with the educational community in outlining the types of training that we need in the industry. We need to be more active in developing proper curriculum and providing financially tight educational institutions, where possible, with training equipment that meets modern standards.

We need to work with aviation educators, government officials, and our own industry representatives to upgrade the recognition of the professionalism, which is the hallmark for much of our work force. Through proper educational programs, training for existing work force, and recognition of professional standards, we can work together in aviation education to continue to offer young people careers in aviation which they will be proud of throughout their lifetime.

The final element which spurred the formation of NCAE was the discussions which we held in exploring the concept of the coalition this past fall and through the spring of this year. It was imminently clear that an important pillar was missing from the aviation education triad. Government spoke through the FAA, NASA, and the Air Force, and articulated its positions and drew interest groups together through effective forums and meetings including the National Congress and International Magnet School Conferences. Aviation educators and institutions spoke through well established organizations such as University Aviation Association (UAA) and American Association of Airport Executives (AASE). However, the aviation industry didn't have a united voice.

It wasn't that the industry didn't have a full and impressive commitment to aviation education, because we did. What was missing was a vehicle which would bring each of our organizations together to understand what we were doing in the field and how we could assist one.

another to accomplish our common goals in aviation education. Therefore, now, the aviation industry can speak through the National Coalition for Aviation Education on education issues and build our education programs, where appropriate, together to maximize our resources and attain the maximum positive impact we can on our targeted goals.

WHY CAN THE NATIONAL COALITION FOR AVIATION EDUCATION MAKE A DIFFERENCE?

As you can see, the NCAE is a unique combination of industry organizations. For the first time, we have joined together to present a united voice on aviation education issues. For the first time we have joined together to marshall the education resources in order to utilize aviation to advance education and social mobility of America's young people as well as to extend valuable technical and business training to those who are already members of our aviation work force. For the first time, the industry's business organizations have formally joined together with labor to present a united front on critical aviation issues involving the future of our aviation industry and the people who are, or will be, the aviation work force.

For the first time, business, labor, educators, and the FAA/NASA/Air Force and other governmental agencies can work together in a true partnership. This partnership was exemplified by the formal signing this morning of the NCAE Charter before the General Session of the National Congress. I believe industry can now say they are indeed the third pillar in the aviation education triad. To further this partnership, NCAE also signed a proclamation establishing a partnership with the FAA in aviation education and public awareness of the role aviation plays in our daily lives.

HOW DO WE AS AN INDUSTRY FULFILL OUR YOUNG PEOPLE'S DREAMS OF SUCCESS THROUGH AVIATION?

To paraphrase an Oriental thought:
If you are planning for a year,
sow rice
If you are planning for a decade,
plant a forest
If you are planning for a generation,
educate a child

I believe aviation has been one of the most motivating forces in the formation of history. Aviation deals with space, which is undefined except by the imagination. People look overhead and say, "if I could only fly, I could accomplish things that today are only in my dreams." Young people can use, and should use, these dreams as a motivating force in achieving their goals. All of our calendars are based upon space and the stars. Navigation, even its most advanced functions, is based on what is above us. Unfortunately, weapons of war use airspace as their medium of destruction.

Mathematics, physics, much of great literature, and many more subjects which we strive to learn in school are all based on the airspace above us. Unfortunately, many of our students think that being a pilot, a flight attendant, a mechanic, or even flying for pleasure are beyond their capabilities. Young people look up beyond their foothold on earth or look at the complexity of modern aircraft and think that it is beyond their capabilities to succeed in aviation. We need to teach individuals to reach beyond what they think they can accomplish today and design a regime that can help them succeed in aviation. We need a program that can help them succeed by learning--learning through aviation.

There is often a gap between young students and their dreams. They think that if they are in inner city schools there is no way they can leave the pavement and reach for the stars. That's wrong. Aviation education can keep these students in school Aviation education can reward the hard working student with avenues of success that, if available, could prevent this student becoming society's prey to drugs, alcohol, or another senseless action of a dead end life. I believe that if you can teach young people to reach for the stars and give them the knowledge to achieve that goal that they will bridge many of the social hurdles that might impede their ability to achieve their dreams.

As long as we have a window that we can see through to something different and better for ourselves, life is exciting. Aviation education can be that window.

WHY DO WE NEED TO BUILD AN AVIATION EDUCATION PUBLIC AND GOVERNMENTAL CONSTITUENCY?

As an industry, civil aviation--and particularly general

and business aviation -- is teetering on the economic edge. If our joint efforts in aviation education are to mean anything, we need to educate our governmental decision-makers, whether on Capitol Hill or n the Executive Branch, that aviation is one of the most critical components of the U.S. economy. These leaders need to know that the nation's aviation infrastructure provides millions o jobs and facilitates economic growth through the safe and efficient transportation of people and goods throughout the U.S. and the world.

The economy certainly hasn't been our friend, but the Federal Government's action and inaction have been a heavy contributor to today's problems. Everyone knows that U.S. commercial aircraft manufacturers and air carriers are in financial trouble. However, if the commercial segment is in trouble, the business and general aviation industry is in the "Critical Care Unit."

Product liability laws and taxing policies have cost general aviation over 70% of its jobs since 1980. Deliveries of U.S. manufactured general aviation aircraft have plummeted from over 18,000 annually in 1978 to under 800 in 1992. It is in general aviation that most of our young people will find aviation jobs and recreational opportunities in their future. Yet aviation does not have an effective constituency in the Congress.

It is time that we, as interested parties in aviation education, step forward and carry our message of industry revitalization to the halls of Congress and, when necessary, to the FAA. It's politics, but educators are some of the sharpest lobbyists at the local, state, and national levels. If we are to give our young people a chance to join the Lindberghs, the Yaegers, or the John and Jane Does who cruise a clear Saturday afternoon in their Cessna 182, or an opportunity to turn a wrench on a B747 or a Piper Cub, we need to develop a more effective and unified voice between industry and educators to bring our message to the public and government decision-makers.

Aviation is critical to the U.S. economy and both the aviation industry and the U.S. economy must be given the tools necessary to perform its tasks. Each must be relieved of the legislative and regulatory burdens which bring no benefit to the public and which diminish aviation's efficiency.

But this is also a time of new opportunity -- any opportunity to advance new initiatives and effective strategies to promote new investment and revitalization, technological innovation and U.S. competitiveness, both at home and abroad. These solutions do not cost the U.S. Treasury a dime, but they can mean thousands of new, high paying, private sector jobs for Americans today and tomorrow.

WHAT IS THE NATIONAL COALITION FOR AVIATION EDUCATION'S FUTURE?

When I first came to Washington after I graduated from college, I came down Constitution Avenue in a taxi to interview on the Hill. I noticed the motto carved on the National Archives building which read, "What is past is prologue."

Since I knew that cab drivers are presumed to be all-knowing about their cities, I asked the driver what the motto meant.

"Oh," said the cabbie, "That's just bureaucratic talk. What it really means is -- you ain't seen nothing yet."

The National Coalition for Aviation Education is here to advance aviation education and to offer, through aviation, opportunities to people seeking to improve themselves. WE just signed our NCAE Charter today but --"You ain't seen nothing yet."

Tyson W. Whiteside graduated from the University of Kansas and holds a Juris Doctorate Degree from The National Law School at George Washington University. He is Director for Governmental and Industry Affairs for the Aircraft Electronics Association, and is also the manager of the ABA Educational Foundation He was recently elected Chairman of the National Coalition for Aviation Education. He has served as a staff assistant and attorney advisor to the Secretary of the Interior and served as a staff assistant to the U.S. Senate Foreign Relations Committee.

DETERMINANTS OF UNDERREPRESENTATION OF WOMEN IN AVIATION EDUCATION

Jacqueline R. Luedtke and Brent D. Bowen

This analysis will study demographics regarding women aviation pilots/educators to ascertain the past, present, and future participation of women in all aspects of the aviation field. This review of women in aviation in general is necessary to establish the interest and participation of women in aviation. Other areas of literature that will be used include data on women entering male dominated fields such as engineering, business, education, etc. Comparisons of how women enter these male dominated fields versus aviation will be made.

BACKGROUND LITERATURE

Since the early days women have been active participants in aviation and aviation education Opportunities for women in aviation did not come easily, but were founded on decades of struggle, determination, and perseverance. One of the most famous figures in aviation history is Amelia Earhart. She won early acclaim by becoming the first woman to fly across the Atlantic in 1928; however, her success was marred by the ~c1 that two male pilots had actually been at the controls throughout the flight, even though she was a qualified pilot Earhart compensated for this by achieving many record-breaking flights, and she eventually flew solo across the Atlantic in May 1932. She was lost at sea while attempting to fly around the world in 1937 (Gyr, 1990).

A year later another woman pilot, Lores Bonney, flew solo from Brisbane, Australia, to London--about five times as far as Earhart's trip across the Atlantic Because she wasn't trying for a speed record and didn't have as good a publicist as Earhart had, her flight was unacclaimed and forgotten over time. There was little notice taken of her remarkable feat; this may have been because of the culture of the day when people believed a woman's place was "in the home" (Gyr, 1990).

Women like Amelia Earhart were highly visible and continually earned kudos and criticism, but most women in early aviation posed an economic threat to the men Any failure was used to prove they were physically and emotionally unfit for flying. Ironically, if they survived an accident, their survival was used to show that air travel was safe (Holden, 1992).

The fact that women comprise only 5.91 percent of all Federal Aviation Administration (FAA) certificated pilots demonstrates that they are as a group under- represented in aviation in relation to their proportion in society (US. Civil Airmen Statistics, 1991). Consequently, the concern accorded regarding the underrepresentation of women in the aviation faculty of higher education is overshadowed by concern for the underrepresentation of women in all aspects of aviation Because the existing statistics provide evidence that the ratio of women in the collegiate aviation faculty is comparable to the number of women FAA certificate holders, the resulting solution must be to increase the number of overall women FAA certificate holders (Bowen, 1990).

Katherine Wright, sister of Orville and Wilbur, helped finance "man's" first flight. Katharine contributed to her brothers' scientific pool of knowledge and to their bank account through their struggle to conquer flight Almost every historian credits her with using the money she earned teaching Latin and Greek to purchase the materials for their fragile airplanes (Holden, 1992).

Ever since that day, women have also been caught up in the "spirit" of flight; unfortunately, few women had the economic means or society's approval of furthering their interest in this area. Influential persons in aviation were aware of women's efforts and accomplishments and could have helped to expand the roles of women in aviation, but they were surprisingly restrictive in their views. For example, Eddie Rickenbacker took the executives of

Table 1
FAA Certificated Pilots

1981			1991		
	Certif. Held	Percent		Certif. Held	Percent
Female	47,721	6.24	Female	40,931	5.91
Male	716,461	93.76	Male	651,164	93.09
Total	764,182	100.00	Total	692,095	100.00

Source: U.S. Department of Transportation, US. Civil Airmen Statistics, 1991 and 1981

Boeing to task in 1930 for hiring the first female flight attendants. He argued that flying was a man's occupation and should stay that way (Holden, 1992). However, the women that persevered thought it important to educate the non-flying public about aviation. From that date to present time, women have been involved in aviation in a variety of ways--and today, women are making inroads into the higher education of aviation in our colleges and universities.

ANALYSIS OF THE BASIS FOR UNDERREPRESENTATION

The primary objective of this report is to analyze the potential similarity between the number of women pilots and the number of women faculty in University Aviation Association (UAA) colleges and universities which offer a baccalaureate degree in aviation Second, data obtained on the number of women faculty in aviation will be analyzed against data on the number of women receiving earned doctorates.

Secondary data was obtained from two sources. Data on the number of women who are pilots was obtained from the FAA which publishes an annual summary of pilot demographics titled US. Civil Airmen Statistics. The data on women receiving doctoral degrees is periodically collected by the U.S. Department of Education This information is reported annually in The Chronicle of Higher Education Almanac. These sources can be regularly reviewed to monitor the progress toward achieving proportional representation for women in both of these areas.

Analysis of the change in the percentage of women pilots from 1981 to 1991 may offer a brief historical perspective. Data from the US. Civil Airmen Statistics (Table 1) compares the ratios of female to male FAA pilot certificate holders from 1981 to 1991.

While the last ten years have seen advances in opportunities available to women, progress has not been evidenced in piloting careers. Data from the US. Civil Airmen Statistics in Table 2 provides a detailed distribution of each FAA certificate category by gender. Both non-flight and flight categories are presented. A comparison between the current data and that from ten years previous is displayed.

Although percentages of certificated women pilots are

Table 2

Female FAA Certificate Holders		
Category	1981	1991
Student	22,591	14,501
Private	19,602	17,514
Commercial	4,101	5,652
Certificated Flight Instructor	2,165	3,629
Airframe & Powerplant Mechanic	1,051	3,901
Airline Transport Pilot	584	2,308
Flight Engineer	189	1,256

Source: U.S. Department of Transportation, U.S. Civil Airmen Statistics, 1991 and 1981

widely disproportionate, higher education is one area which is experiencing gains toward achieving a proportionate role to men. Table 3 reveals the current gender distribution in the higher education faculty according to the 1992 Chronicle of Higher Education Almanac.

Most fields in higher education are experiencing gains in the number of women who are receiving doctoral degrees. In the discipline of education, this figure has surpassed 50 percent; however, in engineering, the percentage is only 8.8 percent (Chronicle of Higher Education, 1992). Inasmuch as there are no doctoral degrees solely devoted to aviation aside from aerospace engineering, Table 4 utilizes data from the Chronicle of Higher Education Almanac to illustrate the number of women receiving doctoral degrees in business, education, and engineering. Business and engineering degrees are important because they reflect the closest degrees to aviation-elated fields in most institutions. As can be seen from Table 4, women in aviation-related degree areas (business and especially engineering) are not making as much progress as much as women with education degrees.

Table 3
Faculty Distribution by Gender

Gender	Number	Percent
Female (100%)	133,497	27.3
Male (100%)	355,503	72.7
Total (100%)	489,000	100.0

Source: The Chronicle of Higher Education Almanac, 1992

DISCUSSION OF SECONDARY SOURCE DATA

A review of the information obtained in Table 2 suggests a view of limited success in the professional categories. The limitation is that as the proportion of women who have become Airline Transport Pilots (ATP) has increased from 584 in 1981 to 2,308 in 1991, the number of women student pilots has decreased from 22,591 to 14,501 during the same time. These figures indicate that the years of 1981 to 1991 have seen a period of attrition within the ranks along with a significant decrease in new entrants. This trend could further indicate a decrease in the total number of women pilots in forthcoming years.

Although regression is evident in several areas, advances and achievements which have occurred are also noted. The progress exhibited

in the notable increases made at the professional pilot level of ATP and Commercial held ratings demonstrates that new inroads are being achieved by women in aviation. Table 2 further illustrates other accomplishments made during the last ten years.

The demographic data viewed in Table 3 discloses that 27.3 percent of all higher education faculty are women Currently, the median figure of women receiving doctoral degrees is 36.3 percent (Table 4). Since the doctoral degree represents the primary credential for higher education faculty, the increasing number of women receiving this degree throughout the remainder of this decade suggests that women will obtain a more proportionate role in the higher education faculty. This figure should provide further encouragement to women to pursue faculty positions in higher education as well as to continue the pursuit of the doctoral degree.

Table 4
Percentage of Women
Receiving Doctorates in 1990

Field	Percent
Business	24.4
Education	57.7
Engineering	8.8
Median all fields	36.3

An examination of graduate engineering enrollments offers some insights into the problem of increasing the numbers of women in aerospace engineering faculty positions. Women comprised seven percent of the graduate enrollment in aerospace engineering in 1988, compared to 12 percent for engineering overall. Of advanced degrees granted in aerospace engineering, 6.9 percent were to women versus 11.6 percent granted to women in all engineering disciplines. At the Ph.D. level, six percent of aerospace Ph.D. degrees went to women versus 6.8 percent of Ph.D. degrees in all engineering fields (Changing America, 1988).

These statistics do not offer promise of any immediate increases in the representation of women in aerospace engineering faculties. Even of one- half of all women obtaining Ph.D.s in aerospace engineering choose to pursue academic positions, the available numbers will not permit any great percentage increases of women in faculty positions.

What this means is academic departments and universities as a whole need to actively cultivate their disciplines of aviation management/ aerospace education. Administrators must understand that women, along with minorities and the disabled, do not constitute a high percentage in these areas of study and need to be recruited. Historically, aviation management has been an interdisciplinary discipline and, thus, has had a hard time finding a home in any particular department. For example, at one institution, aviation management might be housed in the business department, while elsewhere It is located in engineering or education. No one really knows where it should be situated and the matter depends on which chairperson is a champion of aviation education. In order to maintain the growth of this field of study, it is important that aviation education/ management find a home in a department that will nourish it so that it can find its true niche. In time, with sustained growth, aviation might emerge as an academic department itself in more and more universities.

RELATED RESEARCH

In 1988, women comprised 51 percent of the population and 45 percent of the nation's workforce, yet they constituted only 11 percent of all employed scientists and engineers. Although the number of women and minorities in science and engineering increased through the early 1980s, the absolute numbers were small and are now declining. Federal employment has not kept pace with the increase in women scientists and engineers emerging from our education system. In 1987, only 10 percent of the Ph.D.s employed were women, although women earned 17 percent of the Ph.D.s awarded in science and engineering. The declining enrollment of U.S. graduate students is masked by recent high enrollments of foreign students in these fields, especially engineering. As of 1988, 75 percent of graduate students receiving financial support from university engineering departments were foreign nationals. The cultural attitudes of foreign students, particularly if they are instructors, may discourage some Americans, especially women, from taking science and engineering courses (Changing America, 1988).

A task force was established in 1988 to examine the current status of women, minorities, and the handicapped in science and

engineering positions and to develop long range plans to advance opportunities for these people in our society. The task force's recommendations are important for universities to understand and to implement. Interest in science and aviation increased during the high points of the United States' space program. We need to be aware of this increased interest and to act upon it.

The Task Force on Women, Minorities, and the Handicapped found that, although women enter graduate school at about the same rate as men, they are considerably less likely than men to obtain a Ph.D. (Changing America, 1988). These trends among the traditionally underrepresented groups cannot continue. Strong leadership from presidents, deans, and department heads with a vision to the future is needed. The departments in these areas must increase their underrepresented faculty members in order to change with the times and attract the traditionally underrepresented students. The Task Force stated that we must produce enough professionals, including more from underrepresented groups, to meet the demand for faculty, industry, and Federal personnel by the year 2000. Specifically, universities should (a) lead in creating a climate of action and accountability that accelerates the participation of underrepresented groups in all aspects of their institutions; (b) set quantitative goals for recruiting, retaining, and graduating more U.S. students in aviation and sciences, especially from underrepresented groups. Departments should set similar goals and take responsibility to ensure that more students from these groups attain doctorates and obtain faculty positions; (c) provide child care for families of students and faculty; and (d) establish transfer centers with qualified counselors in 2-year colleges to ensure maximum flow talent from these to 4-year institutions (Changing America, 1988).

CONTINUING RESEARCH

Searches through the literature of all popular sources have resulted in little summary information about the representation of women in collegiate aviation education. Inadequacies in popular literature may be attributed to the few professional educational journals in the field of aviation and/or to the lack of a publishing excitation of aviation education faculty. The insights and conclusions of this study may add useful information to the body of
understanding not only on the future of women in collegiate aviation education but also how this translates into the future of collegiate-trained professional aviation managers and practitioners.

This effort has merely touched upon the issue of underrepresentation of women in the collegiate aviation faculty. Not included in a work this brief are the numerous specific examples of the contributions that women have made to aviation, and more specifically, aviation education in the nation's colleges and universities. This information alone may result in several articles. Data from a national study on this issue is currently in process by the authors. Upon final analysis, a manuscript will be submitted to The Journal of Aviation/Aerospace Education & Research (JAAER) for review.

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AVIATION & AEROSPACE EDUCATION:

A POSITIVE IMPACT ON THE 21ST CENTURY

Patricia Fleener-Ryan

Are we "A nation still at risk"? (Newsweek, 1993) Ten years ago the National Commission on Excellence in Education published a gloomy picture of the state of the American educational school system. The commission predicted that the country would be consumed by a "rising tide of mediocrity" in elementary and secondary schools unless major changes occur within the System. According to the latest news reports from Associated Press and Newsweek magazine, yes, this Nation is still at risk--"real change has been remarkably slow" (p. 46).

Issues cited in these 1993 news reports, for example, are:

- ◊ low expectations for our students and school systems;
- ◊ bored and unmotivated students;
- ◊ expecting others to remedy the situation;
- ◊ overall educational focus unclear;
- ◊ poor and violent home environment;
- ◊ lack of adequate funding for educational programs;
- ◊ a need to eliminate political interference in education.

As reported in the Daytona Beach Sunday News Journal (Educators Remain Critical 1993) a very bleak view was written in the April 1993 issue of Phi Delta Kappan by Emeral A- Crosby, principal of Detroit's Pershing High School. Crosby wrote, "Our children might be better off if they declared sovereignty and then asked for foreign aid" (p. 6A). The point here is that our American educational school systems need to be given higher priority at all levels in our government and society.

INTRODUCTION

The time is ripe for new and innovative ideas to emerge to offset the downward spiral in student motivation and performance. Aviation/aerospace educators need to become more actively involved in the American educational system and enrichment programs. First, however, we need to examine the issues and determine the future of aviation and space education in relation to these "bleak" times in the history of America's educational programs. Also we need to be aware of emerging technologies and how these technologies can enhance and/or implement education reforms using an aviation and space education approach. Issues concerning the role of the federal and state government, industry, and academia in aviation and space education need to be addressed as well as the cultural diversity in aviation and space education.

Dr. Elaine McCoy wrote in the 1990 University Aviation Association Fall Education Conference Proceedings that "Aviation programs encompass the development of skills ranging from the technical to those of human interaction and decision-making. Such diversity strengthens the discipline and reflects the various demands of the industry" (p. 1). Aviation and aerospace educational programs have been used beneficially as a teaching/ learning tool in education for several decades with documented success.

TASK FORCE APPOINTED

Looking back in the history of aviation and aerospace education, California is noted as being heavily involved in the application of the aviation/aerospace sciences in education early in the 1970s. In 1971, then California

governor Ronald Reagan created an Office of General Aviation He further appointed a task force to specifically investigate the uses and benefits of various aviation/ aerospace applications, as teaching/learning tools in the elementary and secondary schools of California This task force concluded that the State of California should assume a positive role in sponsoring and supporting greater development in aviation and aerospace education offerings, and that the benefits would far outweigh the costs of implementing these programs (Report of the Governors Task Force..., 1971).

The following statement made by Governor Reagan to the Aerospace/aviation Education Task Force in June 1%9 provides a reason for incorporating aviation and space education in our classroom activities: "The complexities of this air age demand that our educators bend their efforts toward adapting space and aviation concepts to the task of furnishing our young people a sound basis of understanding of the world around them" (p.Preface).

A Teacher's Guide to Aerospace Sciences, published by the Lincoln, Nebraska Public Schools, summer of 1966, states: "The aviation and aerospace society in which we now live is yesterday's dream, today's frontier, and tomorrow's life" (Office of General Aviation, 1971, p. 4).

MULTI-LEVEL CURRICULA DEVELOPED

We are in that "tomorrow's life" now. Multi-level aviation and aerospace curricula have been developed and these multi-level curricula are offered free to all interested individuals through the Federal Aviation Administration (FAA), the U. S. Department of Transportation (DOT), the Civil Air Patrol (CAP), the General Aviation Manufacturers Association (GAMA), the Beech Aircraft Corporation, the Cessna Aircraft Company, and the Airline Owners and Pilots Association (AOPA), to mention just a few.

Magnet and Saturn Schools Initiated

Moreover, successful programs using aviation and aerospace in the classroom have occurred throughout the United States and the world. Teacher workshops are offered to encourage and assist educators in incorporating the various aviation/aerospace concepts and materials into the classroom. "Magnet" and "Saturn" schools have been initiated and are utilizing aviation and aerospace across the curriculum to teach the concepts and skills designated by the educational systems. Summer youth programs across the nation are promoting aviation awareness and potential career choices. Recognition and awards are given to educators by national aviation and aerospace organizations and individuals to encourage participation and high standards of excellence in teaching.

However, the impact of these programs remains localized, and the success is measured accordingly.

DEVELOPING AN EDUCATIONAL FOCUS

The future of aviation and aerospace education lies in addressing the national, state, and local educational needs with a program proven to be highly motivating--a program that offers the opportunity to teach, practice,

and apply relevant concepts and skills to students wanting to succeed in the modern world.

However, effort must be made to reach beyond the immediate area. Cooperation and support of major state

and national leaders in education must be gained. For example, the Florida Aerospace Education Association was formed a few years ago to organize individuals interested in developing and promoting aviation and aerospace education A quarterly newsletter is published which offers a vehicle for sharing of ideas and keeping current with upcoming aviation and aerospace events. The success of this effort depends on the interest and participation of the members and the growth of the organization Membership includes individuals from the Air Force Association (AFA), the Florida Department of Transportation, the educational institutions, and from business and industry.

SERVE

Educators who have created and implemented successful aviation/aerospace classroom activities should share their programs with South Eastern Regional Vision for Education (SERVE). SERVE's mission is to operate as

an education laboratory providing leadership, support, and research to assist state and local efforts in improving educational outcomes. SERVE also offers a series of publications addressing issues of present relevance and importance in education, which are practical guidebooks for educators (Jordan, 1993).

In the January 1993 publication, Using Technology to Improve Teaching and Learning, the editors explained:

Technology can fill the gap between the promise and the reality of educational computing, but it will take motivated, innovative, and informed teachers to bridge it. ... To meet educational challenges of the 21st century, we must "think in the future and act in the present." (Thornburg, 1991, p. 111)

CACEL

Aviation and space education uses technologies to illustrate and apply aviation and aerospace concepts. For example, I developed the Computer-assisted Aviation Career Exploration Lab (CACEL) to provide more experiential learning opportunities for K-12 students. The CACEL program utilizes computer technology to simulate and incorporate flight and air traffic control skills. An intercom/radio communication system with headsets adds to this realistic but simulated scenario. Meteorology/flight service and flight ground school stations are part of this aviation simulated educational adventure. The interest from public and private school systems has been overwhelming. Since the opening of this lab in mid December 1992, more than 1,010 K-12 students, teachers, and parents have successfully participated in the CACEL multi-career experience, and 17 additional tours (approximately 760 K-12 students and adults) are scheduled for the CACEL program before the first of June 1993.

Computer-based curriculum materials and simulation using aviation/aerospace concepts capture the interest and attention of students and have relevance for future application "Technology-based activities offer many opportunities for students to reconstruct and produce knowledge in ways that have intrinsic value and will benefit them in their personal and professional lives" (Jordan, 1993, p. 46).

THE CHALLENGE OF NEW FRONTIERS

Aviation and aerospace involves past, present, and future application incorporating the newest and latest educational technologies. It is the challenge of the schools, however, to foster an atmosphere 41 which students can be creative, unbridled, and innovative thinkers who will conquer the new frontiers the space program creates.

Model School Act

In 1985, the Florida Legislature passed the Florida Model School Consortia Act to:

> Strengthen the public school system by establishing prototype technology schools throughout the state. These schools experiment and conduct research on how educational technology can be most efficiently and effectively incorporated into schools. Goals of the program are to prepare students for the "rapid changes in society brought about by the infusion of technology in all aspects of life" and to encourage teachers to incorporate technology into their teaching, learning, and management functions. (Jordan, 1993, p. 15)

Embry Riddle Aeronautical University serves as a partner to Mainland High School, Daytona Beach, which was chosen as one of the two designated high schools in the State of Florida

A Changing Role

Certainly, the role of schools in this new age of space and high technology is drastically changing, putting much greater emphasis on content and job relevancy. Aviation and space education is ideally suited to meet these challenges.

The role of the federal and state governments, industry, and academe in aviation and space education must be one of cooperation and team effort. "Rapid changes in world economic conditions are creating enormous pressures on business and industry to become more competitive and help their employees become more productive" (Gustatson, Feb. 1993, pp. 28~29). Business and industry have a vested interest in the educational systems for future human resources with skills and abilities that will fulfill their needs. Federal agencies such as the FAA are committed to helping meet rapidly changing technology by supporting sound education for all students.

Cultural Diversity

Cultural diversity in aviation and space education is achieved by placing emphasis on the person as a unique individual. Aviation and space education and activities attract all types of people from all walks of life and cultures. The examples of individuals from all cultures serve as role models to encourage the youth of today to

plan and set goals for tomorrow. All students, no matter is responsive to the future needs of the student and to what their cultural background, need to be aware of the benefits and opportunities that aviation and space education has to offer.

SUMMARY

How much impact aviation and aerospace education has on the 21st century depends on each of us. Our nation needs our commitment and dedication to help educate the youth of today to be more knowledgeable and resourceful contributors in tomorrow's society. It is time to focus on higher standards and expectations in our education systems.

We need to take control and take charge to remedy this "mediocrity." Using aviation and space education to set high standards for achievement and to motivate and encourage bored and uninterested youth has proven to be cost effective and educationally beneficial.

Educators and politicians alike call for education that is responsive to the future needs of the student and to the changing goals of a technologically advanced country. Aviation and space can be the driving force that causes students of all cultural backgrounds to excel. It is the duty of schools, governments and industry to reach students to help develop their self-confidence and assist them to visualize a valuable future.

The Teacher Resource Center at Embry Riddle Aeronautical University has a visual proclaiming our theme of AIM HIGH! The acronym "AIM" is derived from:

Aviation and space education
Imagination
Motivation

We need to employ the embodiment of AIM in what we are teaching today so that our youth can AIM HIGH in their goals and expectations--which will make a positive impact on the 21st century!.

Patricia Fleener-Ryan, Director and Coordinator of the Federal Aviation Administration Aviation Education Teacher Resource Center at Embry Riddle Aeronautical University, earned a Masters of Arts degree in Instructional Technology and a Bachelors of Science in Elementary Education Ryan is the 1993 winner of the A Scott Crossfield Aerospace Education Teacher of the Year award. In 1990 she won the FAA Southern Region Award and the National Aviation Education Individual Champion Award. In addition to serving as an Educational Specialist for the civil Air Patrol, Ryan also conducts workshops, institutes, and youth programs.

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WHAT EVIDENCE EXISTS TO VERIFY THAT LEARNING THROUGH AVIATION WORKS?

Mervin K. Strickler, Jr.

Educators and advocates for change of our schools in general, and to increase student performance in particular are increasingly turning to aviation education, learning through aviation, and/or aerospace education. Two major forms of learning through aviation are found The first is simply the study of aviation- for its own sake. Studying ground school and then going on to learn to fly is an example of this. A higher, more sophisticated form is that found in specialized high school and undergraduate college and university programs such as those in Aviation High School in New York or Embry Riddle Aeronautical University in Daytona Beach, Florida. The second form of learning is the central purpose of this brief paper.

This paper is concerned with the uses of aviation as a central motif, core, thread, or magnet around which to design worthwhile educational programs, activities, projects, courses, and learning experiences in order to facilitate learning--learning not just aviation but also learning basic subjects which most people feel good schools should provide. For purposes of this paper, elementary and secondary education are the main examples used.

Within five years after the Wright brothers made their historic first controlled flight, an imaginative physics teacher, H. LaV. Twining of the L£)s Angeles Polytechnical High School, used aviation examples to facilitate learning in his classes. His 1908 initiative is the first recorded example of using aviation to encourage learning of basic scientific principles. Strickler (1968) went on to point out "Although it still lacks a place in the curriculums of the majority of schools and colleges, aviation and space education is producing a growing interest today, kindergarten through the university" (p. 307).

In 1993 many schools and colleges still do not use learning through aviation. However, there are many more examples today than in 1968. There would undoubtedly be more if educators relied that learning through aviation works. But what is the evidence?

The landmark study that demonstrates the powerful influence that learning through aviation can provide students was done in the 1960s despite the fact that imaginative teachers had been using aviation as a means to facilitate learning since 1908.

It should be understood that what this paper briefly describes is the use of the study of aviation as an educational means to leaning goal ends. While many millions of people have studied aviation successfully, comparatively fewer students have had the opportunity to use the study of aviation to assist them in learning basic subjects or disciplines.

THE ROOSEVELT JUNIOR HIGH PROJECT

The first documented example of a program matching a group of students with a control group was at Roosevelt Junior High School in Richmond, California starting in 1968. The basic aim of the study was to determine if the use of the study of aviation would improve the performance of a group of generally nonperforming students. All the students needed such remedial help. As (1969) described the Learning

Through Aviation experiment in his final report:

> This study summarizes the effects of an educational experiment which used a light, single engine airplane to generate basic instructional and behavioral changes in an inner city junior high school class. The project involved 25 disadvantaged area, 13- year-old boys and their parents, four regular staff teachers, two pilot instructors and a college student tutor.
>
> Evaluative research sought to determine

> the feasibility of an interdisciplinary aerospace program under the direction of average teachers, in motivating this group of low and underachieving pupils, characterized by negative self-perception, behavioral problems, poor attendance, truancy, high rates of suspension and grades too poor for college entrance.
>
> Research objectives included a determination of the value of the flight program in terms of increased motivation. That is, the extent the flight program has succeeded in (a) motivating students to achieve academically, (b)motivating students to attend school more regularly, (c) motivating students to become more involved for a greater percentage of their classroom time in instructional and less disruptive and resistant behavior, (d) elevating the level of self-esteem and aspiration of the pupils, (e) improving the chances of higher education for the pupil and (f) altering the perception of the teachers and parents of these youths as regards their scholastic ability. (p.1)

Clearly, the objectives of this educational experiment were monumental. Conway (1969) described the evaluative research design, instruments used, and base line data as follows:

> The evaluative research design provided for constant retrieval, analysis, and feedback of relevant data, thereby allowing a qualitative as well as quantitative assessment of outcomes. The establishment of an onsite evaluation station at the project school furthered this assessment and served to meet the diverse feedback requirements of respondent populations (e.g., teachers, pupils, administrators) with often divergent perspectives. The willingness of the schools to cooperate fully was essential in this regard.
>
> Research instruments included the following: Staff Confidential Schedule, Pupil Attitude Inventor, Parental Interview, Instructor logs, SRA Math Test, Gates Reading Survey.
>
> The group selected for the flight program had the following characteristics: (a) all male, (b)80% Black, (c) average age 13.3 years, (d) a resident of the disadvantaged or "target" area for a minimum of five years, (e) low and underachievement as measured by standardized tests and grades in academic subjects, (f) I.Q. scores ranged from a low of 78 to a high of 104, (g) one or more significant behavioral problems associated primarily with school and/or family background. This group was matched with a control group at another junior high school
>
> Experimental group students were found to range from average to below average in reading ability. In no case did any of the original group evidence a very good ability in reading (p.3)

Anecdotal and other data clearly demonstrated that the students in the program were in trouble. School attendance, discipline problems when in school, poor study habits, lack of self-esteem, and perceptions that they were losers were manifested by students, teachers, and even some parents.

The genius of this program was that the emphasis was on learning. The study of aviation, learning to fly, ground school, and actual dual flight instruction were professionally used as a highly motivational means to the important school curriculum ends. All of the traditional school subjects were taught. However, each teacher of these subjects (and none had an aviation background) was given a short, intensive exposure to ground school subjects and an orientation flight The teachers were asked to relate the various ground school subjects to their disciplines wherever possible. The flight students soon discovered that there were important areas of relevance between their ground and flight study and experiences and their regular school studies. The results were phenomenal. Students began to relate geography to flight planning and industrial arts to model aircraft building and structures studies; in addition, students improved communications skills by writing and talking about their flight interests and experiences, and they learned to apply mathematical

principles to navigation problems. In short, the students demonstrated beyond any doubt that learning can be enhanced by the use of the study of aviation. No such gains were made by the matched control group.

All of the flight students improved in reading ability, grades, and school attendance. For example, the control group averaged fourteen days of absence during the first year, and the fight group averaged two days.

Follow-up interviews with each of the flight students' parents revealed high praise for the project. Also, parents indicated that their expectations for their sons were raised. Following are some excerpts from the interviews as reported by Conway (1969):

> I was very excited and thrilled about the program. All the neighbors and friends of ours were very happy for Bob and wished their sons could have been chosen.
>
> Donald likes it. He does his homework steadily now. This is a new habit . . . the neighbors and relatives envy us. We are very proud. ... Donald writes his brother in Viet Nam about his flying and his brother writes him back to do well 'cause it's an opportunity he never had.
>
> I was afraid of flying at first, but through the program, Steven and I learned a great deal. Steven is now more interested in school He
> wants to go to school more now.
>
> The flying and all made a difference for Billy. It kept Billy out of trouble all year. He is looking forward to being in the flight program again and wants very much to become a pilot This has made a better student out of him. For the family, it has given us a little prestige and honor to have a child off this street to be in the flying program.
>
> Elmer now wants to have an aviation job. Mr. White (husband) feels that Elmer's chances in life are greater now. He is more capable. The neighbors think it is great. but I think some of them are even jealous and act hostile to Elmer (p. 18)

All of the parents expressed pride in the fact that their sons were in the flight program. Further, they felt their sons were now more enthusiastic about school.

The foregoing information represents only highlights of the I-earning Through Aviation historic Richmond project Space does not permit more details here.

In addition to touching the lives of the students, parents, staff, and others in the community, the Richmond project has had a far-reaching influence on education in other parts of the nation.

By 1975 follow-up studies of the 25 flight group students showed that 5 were serving in the armed forces (4 in the Air Force), 10 were in higher education institutions, 5 had found well paying jobs in industry, 2 were unemployed, and 1 could not be located for an interview. As Conway (1976) wrote:

> This longitudinal study has produced considerable "hard" data as well as qualitative results supportive of the flight project concept. Former project youths are demonstrably better off than controls in the areas of employment, advanced education, and avoidance of deviance. Finally, project youths appear to have grasped the linkage between advanced schooling and career potential as their essential and available source of power (p. 574)

The obvious documented success of the Richmond project inspired other notable examples of the uses of the airplane, space and transportation, and other attractive topics to serve as the central motif for planning educational programs. Following are some programs that owe their origins to the knowledge gained in the Richmond experiment

AN AVIATION HIGH SCHOOL

The August Martin High School in the Baisley Park section of Queens, New York, near John F. Kennedy International Airport, was created based on the research demonstrated in the Richmond project In the case of the August Martin School, an entire high school curriculum was designed with an emphasis on aviation and related

transportation careers. This school was developed to replace the Woodrow Wilson Vocational High School which had deteriorated from enrollment of 3100 students in the 1940s to 802 students in June 1965.

As Strickler (1979) has written, "Average daily student attendahce had also declined from a high of over 80% to only approximately 50% of the students enrolled attending classes daily by the late 1960s" (p. 3). Using the evidence of the California experiment, "parents, leaders from the aviation industry, community organizations, labor and education formed a committee to see what could be done about the deteriorating Woodrow Wilson Vocational High School" (p.3). The result of the efforts of the community of interests sanctioned by the New York City Board of Education in October of 1969 was to create "a comprehensive high school with emphasis on air transport careers" (p. 3).

In December 1971 the new school opened. It was named August Martin for one of the pioneer black pilots flying for U.S. airlines. Martin was killed in 1968 while flying a relief flight for the Red Cross to Biafra.

Since the first graduating class of August Martin in 1975, its graduates have followed careers in aviation and transportation and gone on to postsecondary education. From its inception, August Martin has had student attendance records among the highest of any school in New Yore For many parts of the nation, August Martin has served as a model for communities that want to use aviation/transportation as a central curriculum theme to plan a magnet school All of this stems from the experiences of the Richmond, California, flight project.

In the 1976-77 school year, a District of Columbia junior high school was converted to a dual thematic approach to leaning via becoming a high school with two elective themes--aerospace and marine science. This school was a direct result of the Richmond project. Detailed evaluations of the Randall Aerospace and Marine Science Project (RAMS), an Evaluation Study may be found in the evaluation studies by Goldberg (1977, 1978).

OTHER INNOVATIVE PROGRAMS

In a report of examples of Learning Through Aviation, Strickler and Dobson (1978) reported on the successful 1974 Embry Riddle Aeronautical University program that resulted from a contract from the U.S. Office of Education to conduct an Upward Bound Program: "The overall goal of the project was to use aviation to motivate financially disadvantaged high school students to continue their educational experiences into postsecondary education" (p.9). The Embry Riddle Upward Bound project was a direct result of the experience gained in Richmond. A modified version of this program continues at the present time at Embry Riddle.

In 1978 the Aviation Education staff of the Federal Aviation Administration (FAA) sponsored a first ever study of the use of the I-earning Through Aviation techniques to be conducted in a psychiatric institutional setting for teenaged (14-17) patients. As described by Novello, Zakhour and Rothenberg (1979) the project was entitled "Sky Challenge for Teens":

> The purpose of this study was to investigate the effects of a specially designed flight training program on the behavior and school performance oft eenagers who were hospitalized with psychiatric problems. Although aviation education has previously been employed as a motivation technique in the education of disadvantaged and under- achieving youths.. this study, as far as the authors are aware, marked the first time that a formalized flight program has been integrated into an overall psychiatric treatment program. (p. 1)

Among the problems for which the group of teenage students had been admitted to the Washington Psychiatric Institute were runaway, truancy, drug and alcohol abuse, antisocial acts, sexual promiscuity, depression, suicide attempt, and psychosis. As Novello, et al (1979) pointed out, the students faced "the customary developmental conflicts of adolescence with despair: trust vs mistrust, autonomy vs dependence, realistic self- appraisal vs omnipotence, identity vs diffusion" (p. 2). They further stated:

> a "Sky Challenge" could be an excellent means of directly confronting these teenagers' educational and psychological conflicts and, furthermore . . . providing a dramatic and useful vehicle to facilitate the overall treatment A "ground school" component

> could be utilized to stimulate and motivate toward classroom learning, particularly because it would be dramatically related to exciting in-flight aspects of the programs. The flights would be presented as a personal challenge to the selected teenagers and, through clinical interviews with staff, the participants would be assisted in relating their feelings, fantasies, etc. about the flights to their own underlying adolescent conflicts. (p. 2)

While this study is limited because of the small number of participants and because there was no control group, clearly it did demonstrate progress in a number of areas for the participants. These were demonstrable gains in self-esteem, self-confidence, trust, resistance to peer pressure, parental pride, independence, improved communication, and mastery of fear as well as the content of the aviation ground school subjects studied.

One must conclude that there is ample evidence that Learning Through Aviation does work. However, there is need for current carefully planned projects with adequate controls to verify the effectiveness of contemporary programs. New studies should be designed to make use of available technology such as high fidelity flight simulation and computer assisted instruction. Most important of all, many more thousands of young people who are in critical need of improving their learning capabilities should be exposed to the effective learning that the study of aviation makes possible when properly understood and utilized.

Mervin L Strickler, Jr., after graduating from Clarion State University in Pennsylvania, received an Ed. D. degree from Stanford University with areas of specialization in aviation and education, the first such degree awarded. He originated and headed the U.S. Army Air Corps College of Aeronautics. Strickler has received the Frank G. Brewer Trophy, the Air Force Decoration for Exceptional Civilian Service and the Federal Aviation Administration Award for Distinguished Service.

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IS AEROSPACE EDUCATION OUTDATED?

Raymond J. Johnson

In considering a topic for the "Issues in Education" Panel at the 1993 National Congress for Aviation and Space Education, it appeared logical to consider a basic question: Is the current aerospace education effort outdated at this time? A quick response is no....but this demise could happen if we fail to adjust to the rapid changes that are taking place throughout our society and subsequently in our schools. The shifting school environment and the emerging generation of adolescents require new considerations in developing materials and activities for aviation/space education. About two years ago an awareness of the gradual decline of young people joining aviation organizations or otherwise becoming involved with their activities was a priority concern of the 39 member organization Illinois Aviation Forum.

THE ILLINOIS AVIATION FORUM

A research project was undertaken to address this concern focusing on the 10-17 year age group. The design was to provide the organizational planners with a description of the attitudes, interests, and values of the emerging generation. A computer search of papers published on adolescent behavior was combined with the output of an invitational working seminar with recognized leaders from the major youth programs. Also, a related survey of aviation and aerospace education organizations was undertaken to determine the content and the delivery systems used for their programs. The full report of this project is available from the Federal Aviation Administration's (FAA) Education Office.

Values and Attitudes Examined

Some pertinent observations from the study indicated several specific factors that should influence the planning process in developing materials and activities. There are strong indications that traditional values, generational attitudes, and motivations are being challenged. Again, it must be stressed that the purpose of the study was to provide insight, leaving the determination to the reader as to whether the changes reported are positive or negative.

Some of the significant societal trends identified were:

The rapid shift to an electronic lifestyle is obvious with children becoming accustomed to receiving information visually and orally. This is affecting reading skills. The traditional two parent family is declining as the norm.

Parents are having a more difficult time guiding their children, who are subject to considerable stresses in regard to drug abuse, sex, academic achievement, and for many young people a concern as to their future economic well-being.

Liability factors are decreasing the number of adult volunteers available to participate in youth activities, and the nature of their involvement is changing.

The media coverage of aviation tends to have a negative tone which has influenced both the public's and young people's perception of aviation activities.

The study also identified significant trends within today's adolescent culture which merit examination:

Teens have considerable sensitivity about social and environmental issues.

Teens are subject to peer influence and frequently it becomes more important for them to be part of a group than to pursue their personal interests.

Electronic simulation games can become a source of realistic action for many young people. The "Top Gun" type of promotion has produced a very macho perception of piloting. A recent article noted that:

basic flight training pales in comparison to the multi-media, high-tech diversions available to most youth. Today a twelve-year old with a PC can shoot an ILS approach in a 747 cockpit. . .and even this is tame when compared with the simulations of flying mock combat with Chuck Yeager in a F17 aircraft. (Illinois Department of Transportation, 1992, p. 10.)

> Even a source for more realistic combat scenarios has been announced as ready for the arcade market. This utilizes a moving simulator with multi-operator capability.

As increased options become available, there is a tendency for teens to drop an activity if quick gratification is not realized. Emerging as a common characteristic is the shrinking attention span coupled with a desire to be entertained rather than mentally challenged.

There is considerable skepticism developing among young people concerning most adult institutions. They want explanations which are logical to them before accepting the necessity of specific rules. Likewise, tradition has a more limited meaning for this generation.

OTHER EDUCATIONAL CHANGES

The field of education is also experiencing significant challenges which may influence the continuance of existing aviation/space activities in the classrooms or the implementation of new activities. Financial constraints are generally increasing with the spreading demand for academic accountability, often accompanied by state mandated goals for learning. The added consideration of societal changes including mounting discipline and liability problems all add to escalating pressures in the classroom environment.

There is, however, strong evidence at this Congress that aviation and space education continues to be as exciting, as challenging, and from our standpoint as vital as ever. It is obvious that there will be an on-going requirement for a critical review of the content, of the packaging, of the marketing, and of the delivery systems being used.

Computers and new technology are rapidly becoming commonplace in schools, even at the very lowest grade levels. CD-ROM is leading to interactive learning techniques. Linked computers and access to established networks are also part of the change in the education process. Group simulation, long-term team problem , solving projects with competitions, and remote inter[acing with guest experts are also adding exciting new dimensions to learning.

It would appear that these developments are ahead of the presently available aviation/space education programs and materials. There is now progress underway to reshape the effort to attract a greater involvement of young people and teachers. For example, the FAA is establishing a readily accessible aviation education data base on the FEDIX computer network Also, NASA and National Air and Space Museum are making computer- based information available.

THE COALITION FILLS A GAP

Another major development which has a considerable potential for a more effective introduction of aviation education to the education community is the formation of the National Coalition for Aviation Education.

It appears that in most states there are some 40 or 50 different organizations independently offering aerospace education materials, resources, assistance, and opportunities to teachers and to young people. This is a great effort except for the fragmentation and duplication that exists. Somewhat disconcerting is the limited follow- through support that appears to be available.

The Coalition initially represents 14 of these organizations, including the FAA. It has the opportunity to develop a common focus and a marketing plan that will produce far better results than each can produce separately. It is conceivable that through pooling resources and through the development of advanced offerings such as CD-ROM, many programs would become available to schools and young people.

Perhaps equally important, this coalition is in an excellent position to establish a working interface with the education associations on the national level. There was a time when one of the leading proponents of aviation education was a committee of the American

Association of School Administrators. Superintendents talking to superintendents on this subject brought action.

EXPERIMENTAL AIRCRAFT ASSOCIATION INITIATIVES

A more direct approach to involve a large number of young people in aviation education is the recent Experimental Aircraft Association's (EAA) creation of the "Young Eagle" program. The stated goal is to provide one million young people with motivational flight experience during the next ten years, utilizing volunteer pilot members around the country. The young participants will be encouraged to join one of the existing national aviation youth organizations or to participate in some other aviation activity.

The Young Eagle program has already produced a secondary value of becoming a major stimulus for other aviation groups to join what could become a "band- wagon" in this phase of aviation education. This is also an opportunity to reverse the frequent image of airports as being "unfriendly" to kids.

In reality only a very small number of the young people touched by this nation's aviation/space education programs will become pilots, aircraft owners, or even be employed in the aerospace field. But significantly all can become informed voting citizens with many moving into positions of community influence. This role also has important implications for the future of aviation and space activities.

Again, returning to the initial question "Is the aerospace education effort outdated?" support can be given to both a positive view and a timely call for the aerospace education leadership to consider a "vision of the future" style of conference to focus upon how the apparent trends in society, in technology, and in education can be addressed for the advancement of aviation/space education.

Raymond J. Johnson, a University of Minnesota graduate in Business Administration and Industrial Engineering, earned a Masters Degree in Education from the National-Louis University. The recipient of many honors and awards, one of which was induction into the Illinois Aviation Hall of Fame and the National Hall of Honor for Distinguished Aerospace Educators, Mr. Johnson is retired as Chief, Office of Civil Air Patrol Affairs and Aviation Education for the Division of Aeronautics of the Illinois Department of Transportation. He is currently a delegate to the Federation Aeronautique Internationale (FAI) General Conference and is Vice President of its Education Commission.

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LEARNING TAKES FLIGHT: AWARD-WINNING EDUCATORS USE AVIATION TO SPARK STUDENT ACHIEVEMENT

Frank G. Mitchell

Eleven teachers from eight different states were chosen as 1991 winners of the General Aviation Manufacturers Association (GAMA) annual Award for Excellence in Aviation Education. The award honors grade school and high school teachers who bring general aviation into the classroom, either as a specific topic of discussion or as a teaching tool.

Most of the winning projects included activities spread over an entire semester or school year. From each winning entry, two or three of the most original or vivid ideas were selected for this article. Enough detail was included so that another teacher can take the ideas and develop his or her own teaching activity. Another intent of this article is to show that aviation-related themes work for all ages and kinds of learners. A summary of the award winners follows.

AVIATION TOPICS PROMOTE TEAMWORK

by Sherilynn Admire
Soldier Creek Elementary
Midwest City, OK

Sherilynn Admire designed the unit "Teaching Aerospace Skills to Kids" (TASK) for disabled and non- disabled learners at the elementary level. She used monthly themes to introduce students to topics including the history of aviation, planets, rocketry, astronauts, and balloons. Two intriguing tasks were filing a flight plan and simulating a shuttle launch.

Teams of students used aeronautical charts of the state of Oklahoma to design their own flight path. They chose a city of origin and city of destination, filed a "flight plan," and filled out "flight logs."

A semester-long study of aerospace culminated in a shuttle launch simulation. Students made mock shuttle control panels of cardboard and chose their own shuttle name and mission; they even designed a patch and wrote a flight log. Admire said, "The flight simulation was accomplished through the power of their imaginations and a taped version of pre-launch, launch, and mission activities. The students learned to problem-solve while being members of a team, to cooperate with decisions and to become aware of the importance of why they need to attend school if they one day want to be scientists or astronauts."

AVIATION CONNECTS STUDENTS WITH POSSIBILITIES

by Donna Sue Combs,
Horace Mann Elementary School
Shawnee, OK

Donna Combs' project "Connections" connected students with their own talents and goals while learning about aviation. Projects throughout the year included "The Great Airplane Fly-Off, in which students, teachers, and guests designed and constructed paper airplanes using four different weights of paper. Airplane races were held in each weight category and winners received a "pilot license." Bulletin boards displayed photographs of the winners and their airplanes.

In "Omniplex Field Trip" students, parents, and teachers enjoyed a field trip to the Air and Space Museum and Omniplex at Oklahoma City. Students sat in a real cockpit and experienced simulator flights.

For "Space Tomatoes" NASA supplied tomato seeds that had orbited in a satellite for 5 years. Students planted both the space seeds and seeds that had stayed on Earth, and compared the results. They talked about

different types of satellites as well as the careers of the people who flew the seeds into space.

ESL STUDENTS PRACTICE THE LANGUAGE OF FLING

by Teresa Y. Hail
Sierra Vista Elementary
Madera, CA

Teresa Hall's "First Grade Frequent Fliers" introduces her students to the world of flight. About 75% of her students are learning English as a second language. The new aviation vocabulary is reinforced with student-made books and fun activities.

The class read the book Me and My Flying Machine by Mercer Mayer, then they talked about their own flying machines before they wrote stories with a partner. They drew pictures of their flying machines and published the stories in a class book

In a science experiment, students played "Huff and Puff" in which they counted how many times they had to blow on an object to move it 3 feet. The results were written on a chart.

At recess time, the students enjoyed "airplane tag" which is played by running with arms extended like airplane wings.

ELEMENTARY SCHOOL "SOARS SKYWARD" WITH LEARNING AND FUN

by Summitt Faculty
Virginia Stevens, Principal
Summitt Elementary School
Austin, TX

The Summitt Elementary School faculty involved all grade levels in "Soaring Skyward" with aviation-related studies.

- Kindergarten - Tako-kichi (Kite Crazy)
- First Grade - Up, Up, and Away (Hot Air Balloons)
- Second Grade - Going to Fly Now (Airplanes)
- Third Grade - Ignition--Blast Off (Rockets)
- Fourth Grade - We navigate the Sky (Navigation)

Their studies came together with a school-wide aeronautics enrichment activity. The school recruited community resource persons representing the four methods of flight and set up NASA exhibits. The activities presented for the students during their special day were a tremendous success.

"Soaring Skyward Day" opened with the Windsock Parade during which children clipped windsocks they made in art class to the school fence. There were presentations by American Airlines, Travis County EMS, Bergstrom AFB, windsurfers, stunt kite fliers, and a remote control helicopter demonstration. The students also painted an aviation mural.

PRINCIPLES OF FLIGHT DEMONSTRATED WITH EVERYDAY MATERIALS

by Lois Wells
Piedmont Elementary School
Piedmont, OK

Lois Wells' "Flight Day" introduced second and third graders to the history and principles of flight, using demonstrations and experiments to help students understand sophisticated concepts. Three examples of these experiments are:

<u>To Show That Air Takes Space</u>

Fill a fish tank half full of water. Place one glass in the tank so that it fills with water. Place a second glass in the water upside down so that the air does not escape. Carefully tilt the air-filled glass under the water-filled glass. By doing this you are pouring air up in bubbles. Each bubble is a small bit of air.

<u>To Show That Air Exerts Pressure</u>

Fill a drinking glass to the top with water. The water should spill over the top a bit. Carefully lay a cardboard square to completely cover the top of the glass. Holding the cardboard on top, turn the glass over until it is straight upside down. Stop holding the cardboard and it will stay on by itself.

<u>To Show That Air Has Weight</u>

Blow up and tie two balloons that are exactly the same. Tie one balloon to each end of a yard sick. Balance them. Prick one balloon with a pin. As the air rushes out, the side with the broken balloon shoots up and the side with the heavier, air-filled balloon drops down.

STUDENTS PLAN LUNAR LANDINGS

by Chuck Arnold Clark Elementary School Erie, PA

In Chuck Arnold's class, each student was assigned devise a method of packaging a raw egg in a shoe box so that the egg would not break when dropped - from an airplane at a height of 400 feet. The students imagined that they were suppliers for a lunar colony. Space vehicles would drop the building materials to the surface rather than land on the moon. The materials shipped to the colony must be packaged so that they wouldn't break on impact. Because of the lack of atmosphere, parachutes would be of little value, so the problem had to be solved by the method of packaging.

Students learned whether their solutions were effective when their prototypes were dropped onto the school parking lot. As a bonus, on the day of the egg drop, they observed a demonstration jump made by a local skydiver.

"STAR" BRINGS AVIATION STUDIES TO RURAL SCHOOL

by Betty Banks
Leedey Public Schools
Leedey, OK

Betty Banks' students in rural Oklahoma explored aviation with her "STAR" program--"Search for Tomorrow through Aviation Resources."

STAR helped satisfy students' natural curiosity about aviation and showed how aviation will affect their future. She used a multi-media approach, starting with the "Let's Fly" video from the FAA, and NASA films. The science unit included visits from an FAA representative who brought an airplane simulator to school. A licensed pilot allowed students to sit in a plane and observe a flight. A local veteran talked to them about helicopters. NASA's Education Specialists brought a mobile resource center to town and presented programs for both elementary and secondary students.

Students made their own air pressure demonstrations with plastic bags and straws, and designed aircraft, using paper plates, styrofoam cups, plastic bottles, etc.

REAL FLIGHT IS HIGHLIGHT OF AVIATION STUDY

by Anne Collinsworth
Clark Elementary
Wichita, KS

Anne Collinsworth taught her fourth and fifth grade students about aviation, including different types of airplanes and principles of flight. They focused on the meanings in English and Spanish of a 40-word list. "But why do all this if they can't actually get in a plane?" she thought, so she arranged for students to take a real flight.

The airplane ride was sponsored by Anne and her husband, Gary, who is president of the Beech Employees Flying Club.

Students were well prepared for Flight Day. Speakers visited classes, including a mechanic and an experimental flight pilot. On the flight, not one student needed an airsickness bag. Collinsworth gave the Saturday event high marks. "I had them so prepared they weren't afraid," Anne said.

AIRPORT SIMULATION TEACHES TEAM SKILLS AND CAREER OPTIONS

by Mary Nell McNeese Oak Grove Elementary Hattiesburg, MO

In Mary McNeese's class, students applied concepts learned in the Language Arts, Math, Social Studies, Art, and Science to their role playing during an airport simulation. Each student chose a different general aviation career and/or aircraft to research. Working in teams they designed and constructed child-sized model aircraft.

The students designed an airport and used non- permanent spray paint to mark an outdoor playing field with runway lights and map directions. They played the roles they had researched to simulate a busy airport. After proper communication with the control tower, each "pilot's" aircraft departed, flew the assigned route and landed successfully. The AOPA Air Safety Foundation's IFR Communication Procedure Book was used as an example of correct wording. The pilots recorded their progress in their pilot flight logbooks.

HANDS-ON PROJECTS MAKE AVIATION UNIT COME ALIVE

by Susanne Paper
Lakewood Elementary School
Rockville, MD

Susanne Paper's "Airlift for Young Minds" used aviation to interrelate the learning of science, computer literacy, math, social studies, writing, art, and music. The first activity was to introduce the story of flight to science students. They learned myths and the legend of Daedalus. History came alive for them when an actor dressed as Leonardo Da Vinci came to the school and demonstrated Da Vinci's recorded thoughts on aviation.

Students made kites and constructed seven-foot tissue paper hot-air balloons. They did several experiments heating air in a bottle. A balloon over the lip of the bottle was heated and students saw that hot air made the balloon rise. Another experiment was to place the bottle in ice; they saw that the cold air condensed into the bottle. They realized that to fly their tissue paper balloons they would have to heat the inside air. They constructed gliders from recycled Styrofoam lunch trays. For a big project, they built a usable airplane desk out of plywood and donated it to the library.

AVIATION MINI-COURSE BUILDS TEAM SKILLS AND SELF-ESTEEM

by Patricia Galarce and Jim Ryan Keystone School
Newton, MA

"Flight" was a week-long mini-course for Patricia Galarce's and Jim Ryan's students at Keystone, a small residential school that provides services for emotionally disturbed students ages 13 to 20. The course stressed peer cooperation, and goals were to expose students to aviation and space, to build group skills, to provide a positive school experience, and to have fun.

Each day started with one of Time/Life's videos on space. A class then introduced the day's concepts, leading into a hands-on activity. After lunch, everyone joined for the concluding activities. Students followed directions to complete projects such as gliders, hot air balloons, and model rockets. They developed positive peer relationships and respect by working together on difficult tasks. The week built confidence in their own knowledge and abilities to explore ideas and develop theories.

Frank G. Mitchell has been involved in aviation education for 28 years. Currently, he directs Beech Aircraft Corporation's aviation education programs as well as Marketing training programs for the Beech retail distribution organization. He is a member of the Kansas Commission on Aerospace Education and currently serves as chairman of the General Aviation Manufacturers Association Education Committee.

Teachers interested in submitting programs for the award should write to the General Aviation Manufacturers Association, Education Office, 1400 K Street NW, Suite 801, Washington, DC 20005, or call: (202) 393-1500.

Want more aviation education ideas? GAMA lists several in the brochure "Activities and Resources to Use in General Aviation Teaching Units." For counselors, GAMA publishes a "Career Brochure" that gives an overview of general aviation careers. You can ask for them by writing to the General Aviation Manufacturers Association, Education Office, 1400 K Street NW, Suite 801, Washington, DC 20005.

PASS IT ALONG

Alexander T. Wells

Among the growing number of aviation educators in this country is the know-how and the background of skills needed to cope with the multiplicity of problems faced by less experienced professors of aviation education. This know-how had its genesis applied to solving problems during the emerging years of aviation education at the collegiate level. I can remember (it hasn't been too many years ago), because of the lack of an adequate textbook, developing handout materials to be used by students in several of my specialized aviation management courses.

In a growing and maturing discipline such as aviation education, it is incumbent upon those with the background and experience to share their knowledge with those who are just entering the field.

Too often we in aviation education have been looked upon by our fellow academicians as vocational educators in a field not worthy of true scholarship and research. Nothing could be further from the truth when you consider the wide range of technical and non-technical subjects being studied today in collegiate aviation programs across the country.

Scholarship includes such activities as developing innovative teaching materials and methods; writing articles, monographs, book reviews and textbooks; delivering papers, colloquia and lectures; creating case studies, computer programs and films; writing impact studies, grants and reports.

The pursuit of scholarly inquiry can be a means of rejuvenation and academic enhancement. I do not think aviation can reach its full potential as a discipline, or its full acceptance by our academic colleagues, until scholarship occupies a prominent place in our philosophy. The failure to include scholarship as an important element in aviation education is a flaw that erodes the image, indeed erodes the status, of aviation programs among other academic disciplines.

Scholarly inquiry, more than any other characteristic, is the base on which academia is built. When aviation administrators choose to not encourage and promote scholarship, the foundation upon which their programs are built is severely shaken. Scholarship should be viewed as an obligation to your profession. Pass it along!

GETTING STARTED

One of the most difficult steps in any written assignment is getting started. This task can be made simpler by following some tried and proved rules of written communications.

Rule 1

Write about a subject that you are intimately involved with. This involvement, ideally, should include both teaching and practical experience. For example, I write about air transportation management. I have worked in the industry for 12 years and have taught courses in this area for another 20+ years.

Rule 2

Work with others when appropriate. In developing General Aviation Marketing (1987, Krieger Publishing Co.), I enlisted the aid of Dr. Bruce Chadbourne from Embry Riddle Aeronautical University who has a strong background in the area of marketing. The result is certainly a far better textbook than I could have produced alone.

Rule 3

Learn as much as you can about the market for your product. In the case of a textbook, you must determine the primary and secondary courses for which your book is intended. Using the University Aviation Association (UAA) directory and other guides to identify collegiate aviation programs, I have reviewed numerous course descriptions in the college catalog microfiche. On many

occasions I have written to the schools and requested course outlines and the name of the text used. Any other information about the course, including grade level of the students taking it, their major, and background of professors teaching it, is helpful in designing your product. I have always found it helpful to develop a list of the strengths and weaknesses of competing texts.

Rule 4

Research, organize, and reorganize before you write a single word. In addition to file drawers crammed with clippings, reports and studies on various topics, when I carry out research, I test the opinions of other educators and industry personnel. I find out what they think is essential and what is nice to know but not essential. You may be surprised by what you will learn. As far as organization is concerned, I prefer using outlines that show the content of each chapter by major topics and subtopics. I normally change the outline several times before I start writing, then several times after starting.

Rule 5

Get involved with a publisher. Do not invest hundreds of hours and then learn that Vanity Press is the only outlet for your work. A publisher will normally want to see one or two completed chapters of your manuscript. They will also require a complete marketing information report. These guidelines are available from all of the major publishers and can be a big help in structuring your proposal. Remember that you have to sell the publisher on the idea that your project is economically viable. The acquisitions editor is going to want to know the primary and secondary courses which might use your text or learning aid, any professional or trade markets, the expected market potential, the approach you expect to use (broad-brush or comprehensive, or applied or theoretical) and how your work will most clearly distinguish your book from others currently available. You must also consider at this point whether your text will include exercises, review questions, objectives, summaries, annotated bibliography, glossary and so forth. The publisher will want to know the approximate length of the book and whether you plan to include illustrations and/or pictures. Finally, the publisher will want to know when you expect to have your manuscript completed in first draft form and what support materials such as a study guide or instructor's manual will accompany the text.

This process may prove to be discouraging, and it may demand more changes than you are willing to make. But remember that a book can be rejected by one publisher and develop a tremendous success with another one. I once received 76 rejection letters before finding a willing publisher.

The publisher will normally assign four or five reviewers to evaluate your project. If you have any suggestions for reviewers, this is the time to get their names to your acquisitions editor. Don't become overly defensive. Editors and reviewers often make excellent suggestions. Use them when appropriate. I have completely rewritten entire chapters based on their feedback, and I know the published work is better because of it.

Rule 6

Write for students and be practical. A technical book should not look like an engineering book or a novel. Write at an appropriate reading level. Do not make the mistake of trying to impress your colleagues. Work hard to make everything as logical and as easy to understand as possible. Even with the mechanical aspects of motivational appeal and structural organization well taken care of, writing can still fall short unless the proper seasoning is mixed in to make the written words tasty and easy to digest. Nothing can fall flatter than a cold collection of generalized statements unsupported by facts and figures. When a point is made, give an example. When a reference is made, use a comparison to something with which the reader is already familiar. In other words, illuminate the unknown by moving to it from the known. It has been said that the most difficult task of an author is making new things familiar and familiar things new.

Quantitative measures are good if not overdone. It is difficult to hold an audience with tomes of statistics but good, round numbers, used properly, will give graphic dimensions to the written word.

Illustrations must not be an after-thought. Many technical authors design most or all of the illustrations for a section or a chapter before writing a single word. You may be amazed at how easy writing becomes after you have a stack of logically sequenced illustrations on your desk Writing then becomes a simple matter of

describing and elaborating on the illustrations.

Produce a smooth transition from topic to topic and chapter to chapter. This is extremely important with subjects that are somewhat abstract. Also, include a lot of student material: chapter objectives, a review of key terms or important facts, laws and equations if appropriate, review questions and self tests.

Many authors are concerned about the length of' a topic or chapter. I once spent a day with an airline scheduler learning the intricacies of this difficult process.

The individual could very well have filled several books on the subject. I needed only a chapter. An informative topic, section or chapter should be long enough to cover the subject but short enough to be interesting. The story should be told in as few words as needed to make the subject understandable and to establish a case.

The same holds true for journal and magazine articles.

Only enough verbiage is needed in any of the three mechanical parts of the structure to meet the need. Usually, the introduction can be handled in 200 to 400 words. The bulk of the wordage is found in the body or text. Using the limits of 2,000 to 3,200 words for the total effort, the body or text would average 1,600 to 2,400 words. The conclusion normally is about as long as the introduction, running 200 to 400 words. The need dictates the length. Too little might miss some points. Too many will lose the reader.

Rule 7

Don't be overly concerned about your writing style. Publishers have a competent staff of copy editors who will review your manuscript page by page. They know what is good; they know what is wanted; they know what is readable. They will make minor changes to the manuscript, eliminating needless repetition, poor choice of words or verbosity, but they do not want to do our writing job for us. Concentrate on the content and structure. Before putting the piece into its final form, read it aloud. A true test of readability is often found in hearing the words since many readers verbalize inaudibly when they read. Reading aloud permits us to evaluate smoothness of flow.

Rule 8

Allow a cooling-off period. I usually write a section or more and then do not look at the material for a week or so. Needed improvements are more obvious when the material is read again later. Word processors make this easy to do. Diskettes are inexpensive, so it is prudent to make backups of all your files.

DON'T BE AFRAID TO TRY IT

We may never write the great American novel or compete with Sinclair Lewis as the country's most prolific producer of prose, but any of us with a message to share can share it, and share it effectively, through the medium of the written word. It requires planning, hard work and adherence to simple, workable rules.

Nobody is more obliged to share his or her knowledge and background with others than the experienced aviation educator. Nobody needs it more than the less- experienced educators entering our profession.

An honest effort to make this contribution should be made by all of us to tell our stories in such a way that they will be both heard and heeded.

The need exists. The experienced aviation educator has the answers to fill the need. The challenge prevails. Failure to sit down and pass on our knowledge and experience is tantamount to something more than nonfeasance--it borders on malfeasance, a willful and wanton non-performance of a task that we know is our responsibility to perform

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